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ABSTRACT

While teams in the business environment are highly structured with clearly defined roles, unstructured project teams in the educational environment suffer from communication and coordination problems. This study at East Carolina University (North Carolina) demonstrated the impact of this lack of structure by providing distinct roles and responsibilities for two sections of an Information Systems class, while leaving two other sections without imposed structure. The structured teams not only reported a more positive experience with the project, they also scored significantly better. This paper discusses team structure, followed by a description of the methodology and results of the study. The paper concludes with a discussion of the findings and implications for teaching and further research. (Author/AEF)

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MAKING PROJECT GROUPS WORK: THE IMPACT OF STRUCTURING GROUP ROLES ON THE PERFORMANCE AND PERCEPTION OF INFORMATION SYSTEMS PROJECT TEAMS

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While teams in the business environment are highly structured with clearly defined roles, unstructured project teams in the educational environment suffer from communication and coordination problems. We demonstrated the impact of this lack of structure by providing distinct roles and responsibilities for two sections of an Information Systems class while leaving two other sections without imposed structure. The structured teams not only reported a more positive experience with the project, they also scored significantly better. This paper discusses team structure followed by the methodology and results of the study. The paper concludes with a discussion of the findings, implications for teaching and further research.

INTRODUCTION

In our experience with supervising student project teams in our information systems classes, we have noticed that students frequently do not like working in groups. On the surface, this seems odd. After all, students frequently prefer to do many things in group settings. For example, they often seek out social events such as sports outings, parties, and meals in which the event itself is usually defined by the collection of individuals that make up the group. Further, even when working on assignments, students often seek out others in order to work together in groups –even when their instructors tell them to work on the assignment individually! Nevertheless, there is still something about being assigned to complete a project in a group setting that students do not like.

What is it about project groups that students dislike? Steiner (1972) and others (e.g., McKinney & Graham-Buxton, 1993; Sadler, 1994; Yamane,1996) have suggested that there are extra costs that are involved in working together in groups. For example, when completing a project alone, a student must only engage in whatever activities the project requires. In a simple sense, the activities, or work, required to complete the project is equivalent to the cost the student must pay to achieve success. However, there are additional costs that students must deal with when working in a group. A large part of these additional costs are the transaction costs involved in engaging in group work.[1]

Transaction costs are those costs that arise because group members must spend time and energy communicating ideas and coordinating activities. There are many components to the communication process that can lead to greater transaction costs. For example, to communicate, a message must first be encoded by the speaker and then transmitted to the recipient(s). The receiver(s) of the message must be able to receive the message and then decode its meaning. Throughout this process, there are opportunities for the communication to be corrupted, misunderstood, or lost. When this occurs, misunderstanding will occur which will either lead to problems with coordination or to a need to communicate the message again. In either case, these types of communication problems lead to greater costs for the group members.

A second cause of transaction costs relate to the overhead associated with coordinating group activities. To carry out their activities, group members must schedule times for interactions, allot time for these meetings, and communicate information about the agenda for meetings. In the context of student project teams, these activities

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involve the coordination of meeting times around student class schedules, extra-curricular activities, and work times. These coordination tasks, in particular, can be quite difficult for students to deal with because members of project groups are often assembled by the instructor in an ad hoc fashion or students self select their groups without considering their schedules or other potential conflicts.

One of the problems that many students face is that they lack experience with working on formal projects in structured group settings. This is not to say that students do not have experience working in groups, but rather that they lack experience with group meetings that are structured and organized. For example, the average business person spends many hours per week in meetings (Panko, 1992). In general, these meetings are well structured. For example, the members of the meeting have defined roles, an agenda is set and announced before the meeting, events and conversations occurring at the meeting are documented in the form of meeting minutes, etc. In general, most students do not have this type of meeting experience.

To examine these issues, we performed a research experiment to identify whether structuring student project teams by assigning roles to group members would help these teams to perform better and have more favorable perceptions about their group experience. In al cases, we expect that the treatment should have a positive impact on performance and perceptions. The next section describes the methodology used in the study. This is followed by a description of our results. The paper concludes with a discussion of the findings and implications for teaching and further research.

RESEARCH METHODOLOGY

Independent and Dependent Variables

This research was designed to assess the impact of assigned roles on group performance and group member perceptions. To do this, we manipulated one independent variable, member roles. In the treatment condition, group members were assigned roles that were relevant to structuring their group interactions (see Figure 1). Groups in the control group were not assigned roles.

Several dependent variables were examined in the study (see Figure 2). These variables can broadly be classified as either performance measures or perceptual measures. The performance measures include project grades and student exam grades. The perceptual measures include group cohesion, satisfaction with the interactions in the group, ratings of group member participation, and satisfaction with the group's performance. The cohesion scale developed by Evans and Jarvis (1986) was used. This scale is designed to measure a group member's attraction to their group. The satisfaction scale was adapted from Green and Taber's (1980) instrument. Several covariates were also examined. These include student ratings of the instructor, student demographic data, student GPAs, student preference for working in structured group settings, and other information about the course. The student's preference for working in structured settings was captured using the Group Procedural Order Questionnaire (GPOQ) developed by Putnam (1979). Perceptual measures and ratings were captured using questionnaires.

Subjects

A total of 106 students were enrolled in the four sections of the course. Of these, 103 students filled out the demographic questionnaire; 56 (54%) were male, 47 (46%) were female. The average age was 23 years. Participants were recruited from four sections of a core business course in information systems (DSCI 3063) taught at a medium-sized university in the southeastern U.S.

Students did not have a choice about whether they were in a treatment section nor about whether they were to participate in the role assignments. Nevertheless, students were not required to participate in the data collection portion of the research (i.e., they were not required to fill out and return questionnaires). To protect anonymity, neither student names nor social security numbers were used for data collection. Rather, students were asked to make up personal identification codes that they could remember and use on subsequent questionnaires. All students were told that a research study was being conducted and that they were not required to participate in data collection nor to turn in questionnaires.

Experimental Procedures

The course was taught by two instructors (the researchers), with each instructor teaching two sections of the course. The treatment, role assignment, was randomly assigned to one of the instructor's sections of the course with the result that the second section he taught (the 12:30 section) received the experimental treatment while the first section (the 9:30 section) was the control. The treatments were counterbalanced in the second instructor's sections (i.e., the first section, the 9:00 section, received the treatment while the second section, the 11:00 section, was the control) to minimize bias introduced by the order in which the courses were taught.

In the sections receiving the treatment, the roles were presented to the student groups during one of the class sessions. During this session, the roles were explained and students were asked to assume one of the roles during their work on the project. Students in each group were allowed to select which role they wanted to assume. Periodically during the semester students in the treatment sections were reminded about the roles. Further, during the middle part of the semester, groups in all sections of the course were required to meet with the instructor to discuss their group, the course project, and to ask any questions they might have. Students in the treatment conditions were reminded of their roles during this meeting and encouraged to continue to engage in their role during the remainder of the semester.

Data was collected several times during the semester. Before groups were assigned and the course project introduced, a demographic questionnaire was administered. This survey asked for information such as the students' GPA, their gender, their preference for using computers, and related information. In addition, the GPOQ instrument was also administered at this time. Shortly after this, students were assigned to groups and, for the treatment sections, roles were introduced to the groups. Approximately one week after groups were assigned, the group cohesion questionnaire was administered. This questionnaire was also administered during the middle of the semester and at the end of the semester. In addition, students were asked to complete a questionnaire at the end of the semester that allowed them to evaluate the course, the instructor, and their group and to express their satisfaction with their project and their performance in the group.

FIGURE 1

STUDENT ROLES

Role & Description of Responsibilities

Presider or Meeting Leader:
This person is responsible for keeping the group's meetings on task. This person should develop an agenda for the meeting and let other group members know the agenda. This person should monitor the group's progress during each meeting and identify where deviations from the agenda occur.

File Manager or Project Master:
This person is responsible for making sure that the assignment/project files are secure, that backup copies are frequently made, and that all members have current copies of all assignments. Where necessary, this person is to coordinate the integration of different components of the database project. This person is to maintain frequent contact with other group members to make sure that they have current copies of all files.

Meeting Coordinator:
This person is responsible for knowing the schedules for everyone on the team (a schedule should be turned in to this member immediately), deciding (based on these schedules) about the dates and times of team meetings, and notifying members of the scheduled meetings. This person has the authority to call a meeting as long as no conflicts exist with any member's official schedule.

Intermediary:
This person is responsible for acting as the primary intermediary between the group and the course instructor. This person is to meet periodically with the instructor to discuss the progress of the group (this does not preclude other members from meeting with the instructor). This person should be aware of how the team is progressing on the project and whether there are any major conflicts between any members.

The Course Project

The course is a common body course required by all Business majors (Accounting, Marketing, Finance, Management, Decision Sciences). One half of the course content is the development of a small information system using MS Access. The project for all four sections of this course was selected by the researchers and involved fairly complex programming techniques. Each major part of the project was demonstrated in class, but the students were responsible for using the techniques in the development of their own information system. For most of the students, this resulted in a significant dependence on the other team members. The teams had to work in harmony to complete the project.

In addition, an exam was given to all of the students requiring each to demonstrate proficiency in MS Access as well as familiarity with the project design. Because of the differing degrees of computer literacy and motivation, team members had to help each other prepare for this exam. In other words, the teams spent a great deal of time working together in course-related activities.

RESULTS

The primary variables of interest in this study are student performance on their group's project, performance on an exam related to the group's project, perceptions about cohesion, perceptions about satisfaction, and perceptions about their group. The means for the dependent variables are summarized in Table 1. The results of the analyses related to each of the variables are discussed below.

To examine the project and exam scores, the scores within each section of the course were standardized to facilitate comparisons between different instructors and sections. For example, one instructor provided extra

FIGURE 2

INDEPENDENT AND DEPENDENT VARIABLES

		Source
Independent Variable	**Variable** Role Assignment	Group Members Assigned Roles by Instructor
Dependent Variables	Student Evaluation of Group Members	Questionnaire (end of semester)
	Group Cohesion	Questionnaire (beginning, middle, and end of semester)
	Group Member Satisfaction	Questionnaire (end of semester)
	Project Grade	Assigned by Instructor
	Project Exam Grade	Assigned by Instructor
Covariates	Preference for Procedural Order	Questionnaire (beginning of semester)
	Demographic Data (age, gender, preference for using computers, etc.)	Questionnaire (beginning of semester)
	Student GPA	Questionnaire
	Instructor	Assigned

credit on the exam and project while the second instructor did not. No significant differences were observed for standardized exam scores. This indicates that there was no difference in the ability of the individual group members across the treatment condition. On the other hand, the results for the standardized project grades show that groups in the treatment condition scored significantly higher on their projects than did groups in the control condition ($F[1,105]=8.585$, $p.=0.004$). These results suggest that the treatment had a significant positive impact on group performance in the treatment group.

Cohesion was measured three times during the semester in order to examine over time the impact of the treatment on group member feelings about their group. Our expectation was that group members in the treatment condition would develop more favorable perceptions of their group when compared to individuals in the control condition. To make certain that groups were similar when they were first formed, we performed an ANOVA comparing cohesion scores across the treatment condition for the first time interval. The results show that no significant difference existed for cohesion between the treatment conditions when the groups were first formed. However over time, group members in the treatment condition reported significantly higher cohesion than did members of control groups ($F[1,60]=8.864$; $p=0.004$). The trend of the results show that cohesion in all groups fell over time, but that it decreased less in the treatment condition (see Figure 3). Thus, the treatment had a positive impact on group member cohesion.

Several other perceptual measures were also captured and examined. These include satisfaction with the group process, satisfaction with the group's project, and group member ratings of their fellow members' participation in the group. None of these perceptual measures were found to be significantly different. Further, no covariates were found to be significantly related to any of the treatment variables.

TABLE 1

MEANS AND STANDARD DEVIATION SCORES FOR DEPENDENT MEASURES

	Treatment Conditions	
Dependent measures	Control	Treatment
Standardized Project Scores	n=47	n=59
Mean	85.1	90.4
Std Dev.	9.7	8.7
Standardized Exam Scores	n=47	n=58
Mean	87.7	11.9
Std Dev.	84.4	16.8
Cohesion (higher = greater cohesion)	n=24	n=38
Time 1		
Mean	155.0	161.0
Std Dev.	15.3	13.2
Time 2		
Mean	147.5	160.7
Std Dev.	21.5	12.6
Time 3		
Mean	139.5	153.6
Std Dev.	29.9	19.2
Satisfaction with the Group's Process	n=32	n=47
Mean	22.3	6.0
Std Dev.	22.7	5.4
Satisfaction with the Group's Project	n=35	n=50
Mean	15.9	2.8
Std Dev.	16.5	2.7
Rating of Participation	n=47	n=59
Mean	100.3%	100.2
Std Dev.	24.3	21.5

LIMITATIONS

Research of this type is always confounded by extraneous factors that cannot be eliminated. One of the most obvious factors in this study was the use of two instructors with their different teaching styles and interactions with the classes. To minimize this effect, the instructors used the same syllabus, texts, assignments, very similar exams, and even agreed upon the wording of our instructions to the students concerning team activities. Instruction was not found to be a significant covariant. Students also react differently in early morning classes, showing more interest in the later morning classes. We both had one class that met earlier in the morning than the other class, therefore, to minimize this effect, we alternated treatments so one earlier class of one instructor and one later class of the other instructor received the treatment. Class time was not found to be a significant covariant. The classes were also of different sizes, with the treatment classes containing a total of 13 teams and the control classes containing 17 teams.

Another weakness was the degree to which the students adhered to the role assignments in the treatment teams and the degree to which the control teams developed their own structure. To minimize this effect, we reminded the treatment teams several times of the importance of their role assignments, but we could not interfere with the control groups. In spite of this weakness, the difference in group cohesion was significant. Overall, we were in a situation with two male instructors teaching the same material to students drawn from the same pool. We are convinced that the similarities outweighed the differences thus resulting in meaningful findings.

Even though we did find significant differences, there were several other factors that we thought would be significant but were not. For instance, we expected the treatment teams to be more satisfied with the experience than the control group. We asked them questions concerning their general perceptions about their participation, social atmosphere and team function. There were no significant differences. Most of the students perceived their involvement in the teams about the same. However, the cohesion questions targeted specific feelings (I feel involved in what is happening in my group.) and actions (If I could drop out of the group now, I would.) related to team membership which were significantly different. Some unknown factors prevented the general perceptions of the treatment teams from being different than the general perceptions of the control system. We were not able to control these unknown factors.

DISCUSSION

During the course of a semester, group dynamics change drastically. During the first several months, the work is comparatively simple and the students enjoy making new friends. However, during the last month, the pressure to complete the project intensifies and the group members find their time being spent on other classes. This is especially true with those students who are majoring in areas other than Management Information Systems within the School of Business and need to focus on their major courses. Most teams procrastinate until the project due date is unavoidable then schedule lengthly sessions trying to catch up. This is frequently one person on each team that is not as stronly motivated as the others and stops participating or *free loads*. During the last month especially, as the pressure increases, intragroup cohesion can be expected to decrease. This clearly happened in all of our groups. However, based on the measures of cohesion reported above, the treatment groups maintained a higher level of cohesion through the midpoint of the project and then ended the semester in much better shape than the control groups. As expected, the data suggests that added structure contributes to the overall health of groups. Another indication that added structure is a positive factor in health of a group is the quality of the results. The treatment teams produced information systems that were significantly superior to the information systems produced by the control teams.

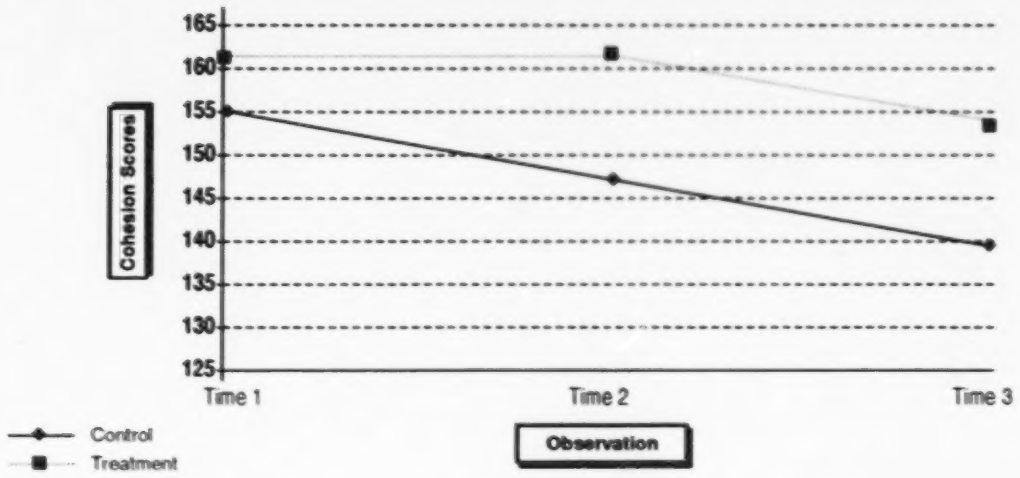
The assignment of roles and responsibilities in a group is one of the factors regularly found in business environments. Increasingly the structure of the academic groups used in this research by the assignment of roles and responsibilites resulted in a significant increse in group cohesion and in the quality of their output. In many courses, the tendency of the instructor is to put the group together and then merely *turn them loose* to perform their assigned tasks. These findings indicate that instructors should do more to provide more internal structure for their groups. They should clarify the tasks that are critical to the functioning of the group, define roles for those tasks, and support the group members that assume those roles.

FUTURE RESEARCH

By the end of the study, one fact had become clear. We were not in the habit of instructing our teams in group dynamics and communication. We usually helped the teams identify team members then graded the teams on the combined activities without instructing them in how to effectively organize, communiate, synergize their ideas, resolve personality conflicts, and otherwise function as a single unit to maximize the benefit of their

FIGURE 3

OBSERVED RELATIONSHIP OF COHESION OVER TIME



varied strengths and abilities. Our next step is to investigate how this instruction can best be accomplished. We are also interested in the use of Internet technologies to increase team performance. One of the problems with student teams is the diversity of their homes, schedules, and outside activities. Several students commute up to an hour for classes and are back home taking care of family responsibilities at the times their team mates want to meet. Having the teams communicate via email, listserv, chat room, etc. would allow the team members to meet at times that are acceptable to everyone. We are interested in how these technologies can best be used and the magnitude of their impact on team performance.

ENDNOTE

1. There are other costs associated with working in groups. For example, Steiner (1972) proposed the idea of process losses associated with group work. A process loss is defined as the differnece between the potential productivity and the actual productivity of the group. There are two sources for process losses: motivation losses and coordination losses.

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